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ABSTRACT

This slide script, part of a series of slide scripts designed for use in vocational agriculture classes, deals with recognizing and controlling diseases found on ornamental landscape plants. Included in the script are narrations for use with a total of 80 slides illustrating various foliar diseases (anthracnose, black spot, hawthorn leaf blight, powdery mildew, cedar-apple rust, cedar-quince rust, apple scab, pyracanthra scab, and other leaf spots); blights (pine tip and juniper tip blights); trunk and stem disorders (fireblight, pachysandra stem blight, cankers, slime flux, black knot, crown gall, and cytospora canker); and vascular wilts (Dutch elm disease, oak wilt, verticillium wilt, and pine wilt nematode). The introduction to the script includes suggestions for using the guide effectively. (MN)

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DISEASES OF LANDSCAPE ORNAMENTALS

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Slide Script

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FOREWORD AND ACKNOWLEDGMENTS

The slide series and script, *Diseases of Landscape Ornamentals*, was originally developed by T. Davis Sydnor, Department of Horticulture. This revision of both slides and script was made by Charles C. Powell, Department of Plant Pathology, The Ohio State University. The series discusses the various groups of diseases found on landscape ornamentals, how to recognize them, and what control measures are recommended. This series should provide the basis for the development of individualized laboratory and classroom lesson plans dealing with plant health problems in landscape ornamentals. The slides and script may be used by students for independent study, make up, or review sessions. For maximum benefit, each teacher is encouraged to adapt the slides and narrative to his or her own teaching situation.

Suggestions for Most Effective Use

1. Select and show those slides which pertain to the specific area being studied.
2. Plan related learning activities that enhance the value of the slide presentation.
3. Make use of important concepts on individual slides to "spark" ideas and stimulate class discussion.
4. Prepare additional personal comments and information to make the series more relevant to local conditions and situations.

This slide series was developed in conjunction with Plant Health Advisory Services of Worthington, Ohio. Cover artwork was done by Jerry King. Editing and layout were done by Muriel N. King. Phototypesetting was done by Jacqueline A. Stuts.

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CONTENTS

page

FOLIAR DISEASES 1
- Anthracnose 1
- Black Spot 2
- Hawthorn Leaf Blight 3
- Powdery Mildew 3
- Cedar-Apple Rust 4
- Cedar-Quince Rust 4
- Apple Scab 5
- Pyracantha Scab 6
- Other Leaf Spots 6

TIP BLIGHTS 7
- Pine Tip Blight 7
- Juniper Tip Blight 8

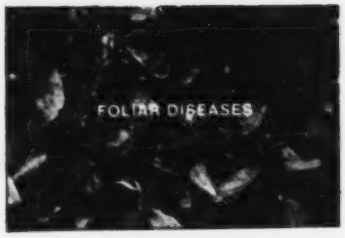
TRUNK AND STEM DISORDERS 8
- Fireblight 9
- Pachysandra Stem Blight 9
- Cankers 10
- Slime Flux 10
- Black Knot 11
- Crown Gall 11
- Cytospora Canker 11

VASCULAR WILTS 12
- Dutch Elm Disease 12
- Oak Wilt 13
- Verticillium Wilt 14
- Pine Wilt Nematode 14

DISEASES OF LANDSCAPE ORNAMENTALS

1. Infectious diseases of ornamentals are still one of the most difficult problems facing both the homeowner and the professional horticulturist. Infectious diseases are caused by a number of different organisms, including bacteria, fungi, nematodes, viruses, and parasitic plants. These pathogens may attack any part of the plant, including the foliage, the young branch tips, the larger branches, the main trunk of the tree, and the roots. Diseases in this slide set will be grouped and presented according to the part of the plant that is visibly affected.

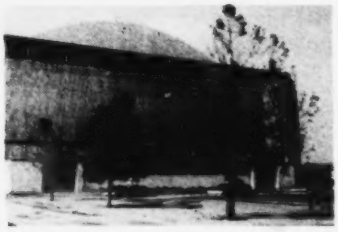
FOLIAR DISEASES



2. Foliar diseases include leaf spots and leaf blotches, as well as some of the rusts and powdery mildews. Most of these diseases are caused by fungi.

Anthracnose

3. Anthracnose is caused not by a single fungus, but rather by a number of fungi that cause similar symptoms. The primary symptom of anthracnose is irregular blotching or blighting. The anthracnose fungi attack oak, maple, ash, and other trees. The major host plants in Ohio are London plane tree and sycamore. The pathogens are most active in cool, wet weather early in the spring.



4. One of the best means of controlling anthracnose is the use of resistant trees in disease-prone locations. All three of the trees shown here are cultivars of London plane trees. The plant on the far right is seriously affected, the plant on the far left has a moderate infection, and the plant in the middle shows few signs of foliar damage. Differences in genetic resistance cause these results.

5. This slide shows a light infection of anthracnose on London plane tree. The foliar damage in this slide is limited to dead streaks extending along the major veins of the leaf. If the weather continues moist and cool, the disease will continue to spread.

6. The disease progresses, as shown here, and develops into a severe infection of buds and newly emerging leaves. The injury looks very similar to frost damage. Because this damage usually occurs in early spring, it is frequently mistaken for frost damage. The plant may be totally defoliated. Normally this does not cause serious damage, but it does weaken the plant. Sycamore anthracnose is unique in that buds may be infested in the fall, causing twig blight the next spring. When control measures are required, fungicides must be applied in both fall and spring.

7. Anthracnose attacks a number of other plants, such as the oak seen here, causing cosmetic injury. On ash, maple, hickory, and oak, the injury is normally confined to the leaves. Defoliation rarely results. Protective spray programs are normally recommended only where injury has been severe in previous years and/or the plant has high landscape value.

Black Spot

8. Black spot disease is a very serious problem of roses. The causal fungus overwinters on fallen leaves. Splashing rain water carries spores to new leaves. New infections develop upwards until all leaves are infected.

9. After several black lesions are formed on a leaf, the leaf will usually turn yellow and fall off. This defoliation is the greatest problem with black spot on roses. Because of defoliation the plant is unable to produce the food reserves required to sustain it through the coming winter. Where defoliation has been severe, the plant often dies from winter injury.

10. Both sanitation and a spray program are warranted to control black spot on roses. The rose shown here was growing next to the one in the previous slide, but was repeatedly sprayed. Depending on the weather and material used to control the disease, spraying may be needed as frequently as once a week during the entire growing season. Spraying must be started as soon as new shoots appear in the spring.

Hawthorn Leaf Blight

11. Hawthorn leaf blight is a common problem, found only on English hawthorn cultivars. A close examination of an infected hawthorn leaf shows angular spots which begin to coalesce (blend together). After the leaf is severely affected, it falls to the ground.

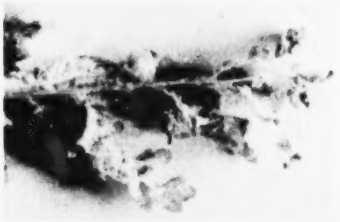
12. The defoliation caused by hawthorn leaf blight is shown in this slide. The lower leaves have all been lost. The ornamental value of this plant is low.

13. Close examination of the lower branches reveals that very few leaves remain on the plant. In this case, the plant is not killed, but its growth rate is considerably reduced. Winter cold or drought may kill all or part of this tree.

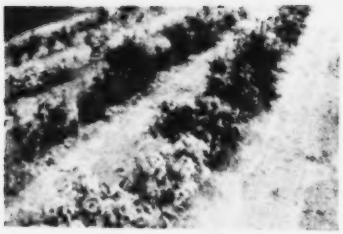
14. Practicing sanitation by removing fallen leaves is a good way to reduce the incidence of this disease. An even more effective way of controlling the disease is to plant a hawthorn which is not susceptible to hawthorn leaf blight. Note the "mistake" planted in this row of English hawthorn in a nursery: a single Washington hawthorn, which is obviously resistant to leaf blight.

Powdery Mildew

15. Almost every plant which is attacked by powdery mildew has its own specific powdery mildew fungus. The fungi do, however, cause similar symptoms under similar weather conditions. The most obvious symptom of powdery mildew attack is a readily visible white-to-gray fungal growth growing on the leaf surface. Sometimes this growth can be actually wiped off the leaf.



16. Damage to this English oak is cosmetic. Most plants do not normally suffer serious damage from powdery mildews. But, if severely infected, the plants can become sensitive to drought and other stresses.

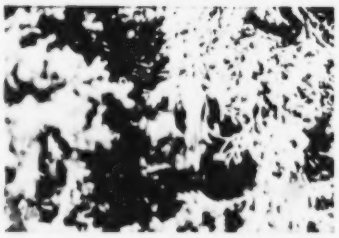


17. Powdery mildews commonly occur on rose, lilac, euonymus, azalea, and many other plants. They can be controlled by using resistant varieties, keeping excessive shade from susceptible plants, and spraying with fungicides. In this slide, the group of azaleas in the background was sprayed at the first sign of the disease.

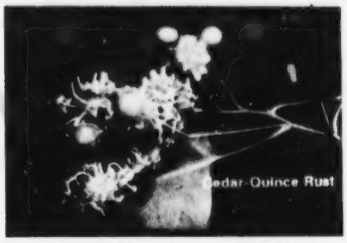
Cedar-Apple Rust

18. Cedar-apple rust was a rather serious pest of commercial apple orchards years ago. The elimination of the alternate host, eastern red cedar, and the use of rust-resistant varieties have greatly reduced the frequency of this disease. The leaf spot phase of cedar-apple rust occurs on susceptible apple, crabapples, and hawthorns. In particularly susceptible plants, the infestation can be so severe as to cause defoliation. With severe defoliation, any apples produced are small, and the plant is more susceptible to winter injury.

19. Cedar-apple rust forms globular to kidney-shaped galls on juniper. Spores from these galls appear in the spring on bright orange fleshy growths called *telial horns*.



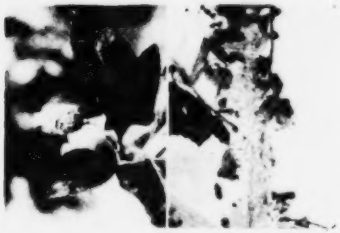
20. The spores are spread during rainy periods in the spring. But they cannot germinate on juniper. The spore must land on a susceptible apple or hawthorn in order to germinate and complete its life cycle. Spores produced in leaf spots of the alternate hosts then spread back onto the junipers in midsummer.



Cedar-Quince Rust

21. Cedar-quince rust is another rust which occurs frequently in Ohio. This rust most frequently affects juniper and hawthorn.

22. The perennial fruiting gall of cedar-quince rust occurs on juniper. Only a small swelling, it usually escapes detection.



23. The injury on hawthorn is considerably more conspicuous and is much more likely to cause concern to the homeowner. Lesions on hawthorn show up as fruit and twig cankers. Spores formed on hawthorn are blown onto nearby junipers. This disease usually will not kill the whole hawthorn plant, only individual twigs.

24. The hawthorn most severely damaged by cedar-quince rust is Washington hawthorn (and several related cultivars). Avoiding use of these cultivars is a good way to control the disease.

25. One of the best ways to control rust diseases is to avoid planting the alternate hosts close to one another. The plants in this picture can easily become infected because they are so close. Fungicide sprays must be used in a situation like this.

Apple Scab

26. Apple scab is a very common problem in Ohio. Not only does it affect the commercial apple producers, but also it is a rather common problem on many cultivars of flowering crabapples in the landscape.

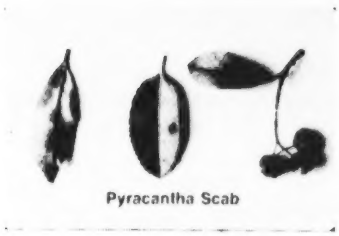
27. A severe infestation of apple scab results in defoliation of susceptible crabapple cultivars, as seen here. Crabapple cultivars should be carefully chosen for their resistance to this fungus. Many resistant cultivars are now available in nurseries and garden centers. Sprays can also be used to prevent this defoliation.

28. Leaves from a resistant crabapple are shown on the left. A susceptible crabapple cultivar is shown on the right. As the lesions enlarge, the leaves may turn yellow and fall off.

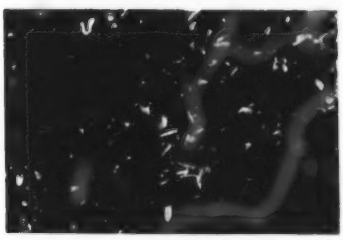
29. Many different cultivars of crabapples are susceptible to scab. Note how different the disease looks on these different cultivars.

30. The scab fungus infects the fruit as well as the leaves of apples and crabapples. Just a few scab lesions will reduce overall customer acceptance of an edible apple and thus cause serious economic loss. On ornamentals, such fruit infection is generally not considered serious.

Pyracantha Scab



31. Pyracantha scab is caused by a fungus different from that causing apple scab. This fungus causes lesions on leaves similar to the lesions of apple scab except that defoliation does not normally occur. The biggest problem with pyracantha scab is cosmetic: it turns the fruit black, as seen on the right of the slide. Of course, orange berries, not black, are what we want pyracantha to bear.



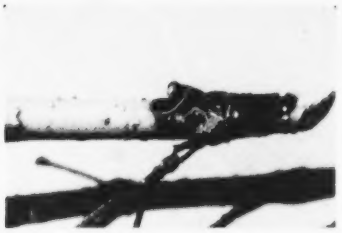
32. Here an overall look at several clusters of infected pyracantha fruit indicates that most of the berries are heavily infected; the aesthetic value of the fruit has been destroyed. Resistant cultivars or sprays can be used to control pyracantha scab.

Other Leaf Spots

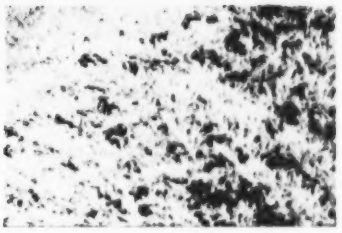
33. Many types of fungi cause other leaf spots on landscape ornamentals. Only a few are serious enough to cause concern. Many, such as this catalpa leaf spot disease, occur on hosts of little ornamental value.

34. In most instances, maples are valuable landscape ornamentals. Two different fungal leaf spots are shown on this maple leaf. Fortunately, these diseases are rarely severe. Leaf spots which are severe year after year on a particular plant can be prevented with sprays properly applied in spring and early summer.

35. This fungus leaf spot on red and yellow twigged dogwood can cause severe leaf drop.

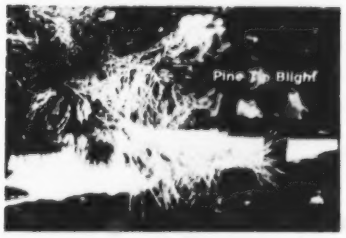


36. The same fungus also causes a stem canker on the dogwood. This makes the disease more damaging.



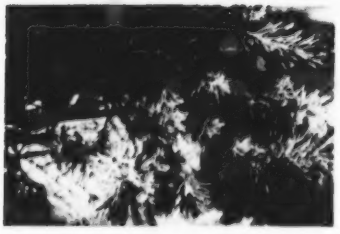
TIP BLIGHTS

37. Tip blights are normally a little more serious than foliar diseases. Usually the entire growing tip of the plant is killed by tip blight fungi. Proper growth of the plant is thus impaired.

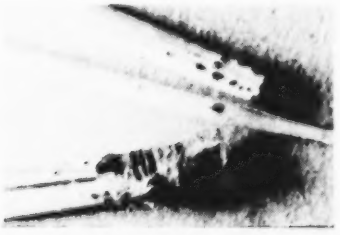


Pine Tip Blight

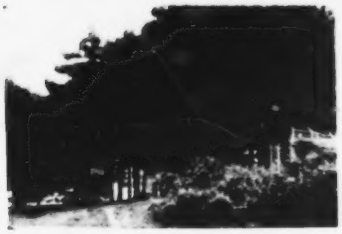
38. Pine tip blight (*Diplodia* tip blight) is a rather serious problem in Ohio on Austrian, Scotch, Mugo, and red pines.



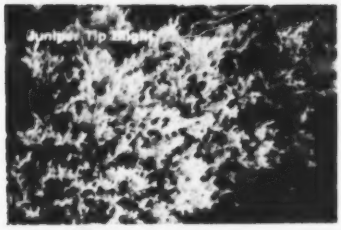
39. The branch tips of this Scotch pine have been blighted by the fungus.



40. A good way to identify pine tip blight is to look at the base of the needle sheaths of affected needles. The black eruptions seen here are the fruiting bodies of the fungus and are characteristic of this disease.



41. Pine tip blight is often associated with trees located in a stressful site. Note here that the disease is worse near the paths and sidewalk. A good way to manage tip blight is to control stress. Sprays can also be used.



Juniper Tip Blight

42. Juniper tip blight (*Phomopsis* tip blight) is a common problem on juniper. Some junipers are so severely affected that we can no longer justify growing them in the landscape. As a general rule, Chinese, creeping, and Savin junipers are moderately resistant to juniper tip blight.

43. These two junipers are severely affected by juniper tip blight. The best way to control this disease is to use juniper varieties which are resistant to this particular disease.

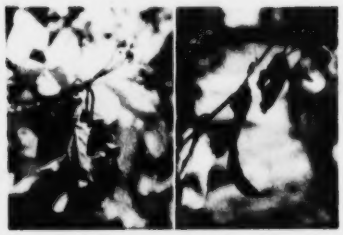
44. This close-up shows the blighted tips characteristic of *Phomopsis* tip blight. The fungus infects when the shoots are new and tender. It soon girdles the tip and kills the shoot. Splashing water spreads the spores about.

TRUNK AND STEM DISORDERS

45. Common trunk and stem disorders seen in Ohio include cankers, branch blights, crown galls, wood decays and slime flux. These types of diseases can be rather severe. In general, they are controlled by using resistant plants and controlling environmental stresses that weaken plants and lead to infections.

Fireblight

46. Fireblight is a serious disease caused by bacteria. This disease attacks a number of plants in the rose family such as apple, pear, cotoneaster, hawthorn, pyracantha, spirea, and mountain ash.



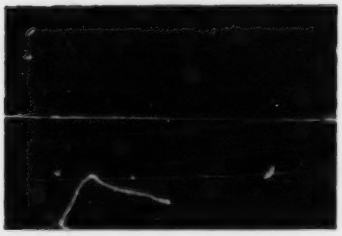
47. An early sign of fireblight infection is dead flower or fruit spikes. Insects visiting the blossoms have carried the bacteria on their bodies. Splashing water can carry the bacteria to new shoots throughout the summer. This often results in the characteristic "shepherd's crook" of fireblight.

48. The dead foliage remains on the branch and frequently darkens almost to black. This charred appearance gives the disease its name: "fireblight." Note that wilting of the new growth again shows the characteristic "shepherd's crook".

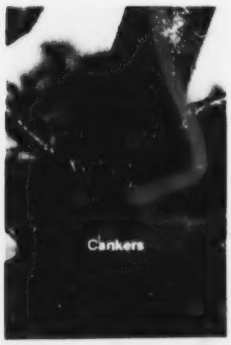
49. Cankers like this are perennial and will live for several years. In them the fireblight organisms overwinter. Such cankers should be pruned out as soon as they become evident. Fireblight is difficult to control by the use of chemical sprays. The best means of managing this disease are to grow resistant plants under low nitrogen conditions and to provide good sanitation. Thoroughly prune or break off new infections as soon as they are seen.

Pachysandra Stem Blight

50. Pachysandra stem blight (*Volutella* stem blight) can be severe enough to destroy an entire planting of pachysandra. The patch of dead plants in the lower middle of this photograph shows the kind of injury caused by pachysandra stem blight. This disease begins in the early spring during wet periods.



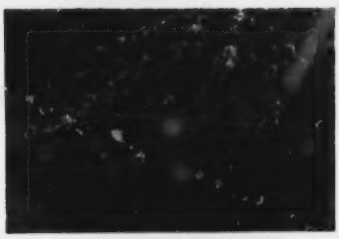
51. The first phase of pachysandra stem blight is leaf blight. With very light infections the injury will be limited to that of a leaf blotch or spot, as seen in the upper picture. Wilting and death of the plants results when the fungus infects the stems and forms cankers at or near the soil line. Such cankers are often covered with fruiting bodies of the fungus, seen in the lower picture.



Cankers

52. Cankers are rather common. They are caused by a number of different fungi and bacteria. Some examples of diseases involving cankers have already been presented. There is a lot of variance in severity of cankers, depending on the type of fungus, the type of host plant, and the amount of environmental stress present on the host plant. In general, cankers are controlled by stress prevention and pruning out infections. The normal procedure is to remove the canker at least six inches and up to one foot below the cankered area so that the pathogen is not spread further. Pruning tools should be disinfected between each cut by dipping in a 70% alcohol solution.

53. Note the very slight sunken line where the bark changes color. This sunken appearance is characteristic of many infectious cankers. In the diseased area we can see the orange fruiting bodies of the canker-causing organism.

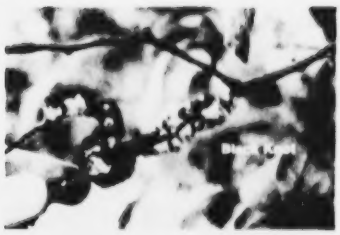


54. A common and frequently serious canker-causing fungus causes nectria canker. This fungus attacks a number of shade trees and shrubs. It is characterized by orange fruiting bodies appearing in the cankered area during rainy weather.

55. Canker-causing organisms can cause distinct internal wood discoloration that extends short distances into the apparently healthy xylem. For this reason it is important to prune cankers at least six inches below any area that is obviously diseased when viewed from the outside.

Slime Flux

56. Slime flux is a problem with various trees, such as elms and oaks. Infected trees, called bleeders, are affected by bacteria growing in the wood. These bacteria build up pressure and force sap outward wherever there is a wound or opening. Slime flux has been flowing over the bark of the elm tree shown here. If this flux continues long enough, fermentation toxins will damage the cambium. As a general rule, fluxing should not be allowed to continue for more than one growing season without installing a drainage pipe into the wood. Infected trees should be watered well during droughts to improve their vigor.



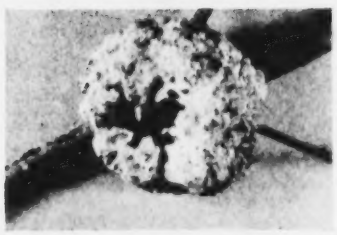
Black Knot

57. Black knot is a common disease of certain cultivars of plums. It is most serious when orchards have been abandoned or landscape maintenance and stress prevention have been neglected. Pruning and burning the infected tissue will result in better plants. The health of infected trees can be improved with watering and fertilizing.

Crown Gall

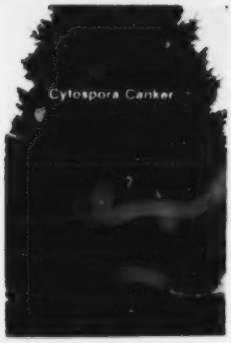
58. Crown gall is another disease seen on many landscape ornamentals, including roses, crabapples, willow poplar, and euonymus. It is caused by bacteria which commonly invade wounds on the plant. After infection, they cause uncontrolled callous growths.

59. This slide shows galls growing on the roots of a small apple tree. If the infection occurs when the plant is quite young, as seen here, death of the tree will probably result in a relatively short period of time. If the infection occurs later, the plant may decline gradually as the disease develops over many years.



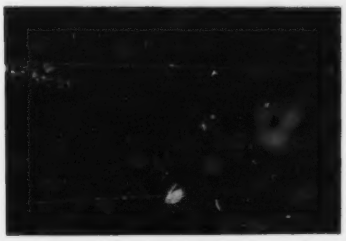
60. Euonymus, poplar, and willow often exhibit aerial galls. Galls like this one on euonymus can be pruned out. However, remember that the bacteria are probably systemic in the plant tissues. Thus, symptoms will probably occur on other portions of the plant even after small portions of the infected tissue have been pruned out.

61. There are no chemical controls that are very effective against the crown gall pathogen. These bacteria can also persist in the soil. Thus, management of the disease involves pruning galls as they appear, inspecting plants carefully prior to purchase, and increasing the vigor of infected plants by watering, mulching, and fertilization. Planting known hosts into ground previously infested with crown gall bacteria should be avoided.



Cytospora Canker

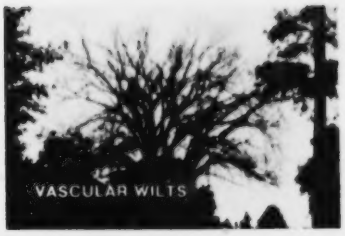
62. *Cytospora* canker is a serious disease on spruce in the landscape. Note how the disease begins on the lower portions of the tree and progresses upwards.



63. The fungus infects the branches, usually at wounds. Swelling and oozing of resin from infected areas can sometimes be seen.

64. There are no effective chemical controls for *Cytospora* canker disease on spruce. Prune out all infections, even if the appearance of the tree is changed by this. Improve the vigor of the tree by fertilizing, watering during droughts, or relieving soil compaction with vertical drilling.

VASCULAR WILTS



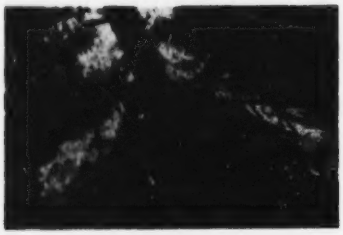
65. Vascular wilts are generally quite serious because the fungi involved quickly become systemic. They then become difficult, if not impossible, to control. They soon plug the vascular system. Death of the plant is the most common result of infection by a vascular wilt fungus.

66. Vascular discoloration may be associated with infection by many of the fungi involved. Note the brown spots in the ring in the oak trunk shown here. Laboratory culturing will indicate if the discoloration is due to the presence of a wilt-inducing fungus.

Dutch Elm Disease

67. Dutch elm disease is a very destructive disease of elms. All North American elms are susceptible to this disease. The infection of the tree shown here occurred a year or two earlier. Now the disease development is rather extensive. Note that the top portion of the tree has already been killed and that the foliage on the lower right side of the tree has been yellowed.

68. Elm bark beetles have caused this tunneling between the xylem and phloem of an elm tree. These beetles are capable of spreading the disease from infected plants in which they overwinter to healthy plants nearby where they feed in the spring on the new twigs of the trees. Insecticides that control beetle feeding in the spring are sometimes used to manage Dutch elm disease.



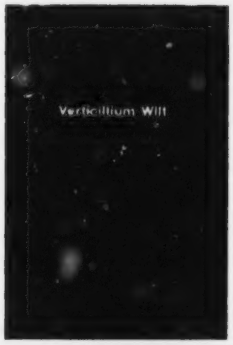
69. The fungus can also travel from tree to tree within the vascular connections that occur in root grafts. For this reason, it is important to trench around and isolate an infected tree as soon as the infection is noted.

70. One of the first signs of Dutch elm disease injury the homeowner might see is flagging or wilting of individual branches. This may include browning or yellowing of the foliage. Pruning away infected tissue may be successful in saving the tree if the disease has not infected more than 5% of the foliage canopy at the time of action.

71. A fungicide is being injected into this tree. Once a tree has Dutch elm disease, it is likely to live for only a few more years without treatment. Thus, fungicide injections are often prescribed if less than 5% of the crown is infected. Such treatments rarely cure a tree, but may save it for many years if such applications are repeated every three or four years.

Oak Wilt

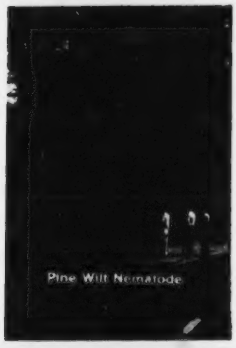
72. Oak wilt, another vascular wilt, in the '60s was thought to be as serious a threat as Dutch elm disease. This prediction of doom, however, never came to pass because the oak wilt fungus attacks only when trees are stressed. Infection by oak wilt can result in death of the tree in a few short weeks, or up to a few years. Red oaks are more seriously affected than are white oaks. Usually the first visible symptoms of oak wilt are flagging or wilting of the foliage, similar to that of Dutch elm disease.



Verticillium Wilt

73. Verticillium wilt is a serious disease of many ornamentals. The fungal pathogen attacks a rather large number of common landscape plants including trees, shrubs, annuals, and perennials. Sometimes the first symptom of verticillium wilt is the dieback of a large branch. Or the entire plant may wilt and die quite suddenly. Since symptoms like these can result from many environmental conditions, further diagnosis is usually necessary to determine the presence of the verticillium fungus.

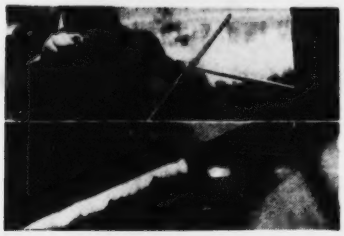
74. Vascular discoloration is often present with verticillium wilt. The color of the discoloration varies from olive green to brown or black, depending on the plant species. Laboratory culturing from such discolored wood can confirm the presence of the pathogen. Since the fungus persists in soil, planting resistant plant species is the only practical means of control. The vigor of infected trees should be increased whenever possible.



Pine Wilt Nematode

75. The pine wilt nematode is often associated with pines that suddenly wilt, turn brown, and die.

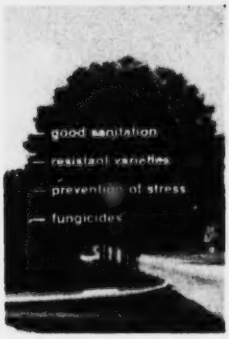
76. Sawyer beetles, which are large borers, infect the trees because they carry the nematode within their bodies. Shown here is the typical large hole made by one of these borers as it emerged from an infected, perhaps dead, tree.



77. The general wilting and browning of a pine can result from many things in addition to infection by pine wilt nematode. To diagnose the disease properly, wood cores must be taken and sent to a laboratory for examination.

78. If nematodes are found, remove and destroy all infected wood to prevent further beetle activity. Prevent infection of healthy trees by maintaining their vigor.

79. In our study of a number of diseases of ornamentals, we have seen that any part of the plant may be affected by a variety of pathogens. In general, remember that diseases are diagnosed by combining various symptoms together into a set or list. Plant disease clinics can be of invaluable assistance in determining the presence and identity of pathogens.



80. Plant diseases are best managed by integrative or holistic practices. The four major lines of defense against infectious diseases of landscape plants are **good sanitation, resistant varieties, prevention of stress**, and **fungicides.**